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Data from three classroom observation instruments (Florida Taxonomy of Cognitive Behavior, Reciprocal Category System, and Teacher Practices Observational Record), used simultaneously by three-member teams to observe 117 teachers and their students, were subjected to factor analysis to identify and define their discrete and overlapping areas and, more broadly, to test multidimensional instrumentation (cognitive, experimental, socioemotional). Results of the study favored multidimensionality as it permits a more diversified system of interrelationships to be analyzed. Specifically, results suggested that high levels of student cognition are related to the student-centeredness and warmth (socioemotional climate) of the classroom environment and to student behavior rather than to the teacher's cognitive level. Regarding the socioemotional climate in particular, it was found that the components of indirect behavior such as teacher warmth and positive reinforcement are not related in the experimental behavior dimension, and that the pattern of teacher behavior is as important as the behaviors themselves. (A seven-item bibliography is included.) (LP)

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A FACTOR ANALYSIS OF THREE SETS OF SIMULTANEOUSLY COLLECTED OBSERVATIONAL DATA: THEORY AND IMPLICATIONS

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A FACTOR ANALYSIS OF THREE SETS OF SIMULTANEOUSLY COLLECTED OBSERVATIONAL DATA: THEORY AND IMPLICATIONS

INTRODUCTION

At present virtually no information is available concerning the relationship of structural properties of observational systems, where they cross contexts in the reflection and description of classroom behavior, and where they remain unique. Thus, a major step must be taken to bridge this apparent research gap before a plurality of observational instruments can be selected with confidence to yield the type and sufficient breadth of information needed to form a more comprehensive approach toward the analysis of classroom behavior. This study represents an effort toward that step.

The purpose of this research, then, was to identify and define interrelationships of three observational instruments, each built to reflect classroom behavior from an explicitly different theoretical vantage point. The three instruments are: (1) The Florida Taxonomy of Cognitive Behavior (B.B. Brown, R.L. Ober, and R.S. Soar) built to measure classroom behavior from the philosophic orientation of Essentialism--"or that combination of realism and idealism which makes the discovery of truth and the acquisition of knowledge the chief aim of education."[1]

(2) The Reciprocal Category System (R.L. Ober) which, through the analysis of verbal interaction, measures classroom behavior along the philosophic demension of Humanism--either the idealistic or existentialist version, which sees the production of "adequate", "authentic", and well adjusted human beings as the overriding aim of education."[2]

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[1]Bob Burton Brown, "Pluralism of Theory and Instrumentation in the Study of Classroom Behavior." Mimeograph --- 1967.

[2]Ibid., p. 4.

(3) The Teacher Practices Observational Record (B.B. Brown) measures classroom behavior from the viewpoint of Pragmatism--or John Dewey's philosophy of experimentalism, which sees the primary purpose of education to train students in the processes of reflective thinking (or intelligent inquiry) and to apply them to the solution of mankind's problems."[3]

THE STUDY

Subjects for the study were 117 teachers selected randomly from some 260 teachers of the Nassau county school system in Florida. More broadly, the "unit" of observation was the classroom, with student as well as teacher behavior being considered. Consequently, the number of subjects whose behavior could have entered the observations, at least potentially, numbers some 3,600 teachers and students. Subjects were drawn from all of the eleven schools in the county, representing twelve grade levels (1-12) and ten different subject areas.

Observations using the FTCB, RCS, and TPOR simultaneously were made in each of the 117 classrooms by three member teams of graduate students in education from The University of Florida. Treatment of "raw" observational data involved the preparation of 19 x 19 matrices for the RCS, and computing item, category, and numerous score totals for the TPOR and FTCB. This reduced raw data to a manageable form, from which selected measures could be abstracted and factor analyzed. The initial series of 70 measures,[4] derived from the three instruments, was subjected to a principal components factor analysis, with varimax rotation. The rotated factor matrix was subsequently analyzed for the purpose of "identifying clusters of classroom process measures which tend to go together on the basis of a common dimension of factor".[5]

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[3]Ibid., p. 3.

[4]For a description of the 70 measures see Table 1, Variables (Appendix).

[5]Robert S. Soar, "An Integrative Approach to Classroom Learning", Temple University, Phila. Pa., 1966.

Results of the study show a relatively clear 12 factor structure suggesting that while some reflective overlap exists among the three instruments, and between pairs of instruments, each retains a wide range of descriptive exclusivit

FINDINGS AND IMPLICATIONS

The purpose of this paper is to build a case for "multi-dimensionality" in recording and analyzing classroom process variables as opposed to current "single instrument" attempts of viewing classroom behavior.

Many related studies have dealt with either one dimension of the present study or another, but no previous study has researched all of the dimensions included here simultaneously. Therefore, many of the findings showing interrelationships between certain variables that were found both within and between the three sets of data studied here carry implications for classroom behavior in general and, more specifically, toward teacher education--both pre-service and in-service.

Relationships between different dimensions of classroom behavior have often been drawn by "after the fact" hypothesizing from single dimension instruments used separately through logico-deductive methods of relationship formation, apart from empirical supporting data, or simply by making wishful assumptions. Consequently, many purely speculative expectations concerning intra and interrelationships involving diverse dimensions of classroom behavior have become manifest in current theory.

Some of the findings here appear to add credence to previously established positions regarding cross-dimensional behavioral relationships while other of these findings carry implications which question certain widely held beliefs and firmly entrenched practices with regard to classroom behavior.

Following are several of the clearest, and perhaps more interesting, findings of the study. Implications are drawn from each finding and an elaboration of

each is made as they bear upon teacher education programs.

As the ratio of level one cognitive behavior (FTCB 1.00 knowledge) to all higher cognitive levels increases so does the ratio of student behavior increase. Or, as teachers behave more at lower cognitive levels, so do their students. (see Factor 12, Appendix)

This finding should not be surprising in light of the fact that more total behavior for both teachers and students was recorded at the lowest cognitive level (1.00 knowledge) than all other levels combined.

Subject area specialists and educational theorists alike speak disparagingly about focusing exclusively upon this lowest level of cognitive behavior, thus neglecting higher level cognition (creativity, etc.). Many of the same specialists and theorists suggest that if teachers will only move up the cognitive hierarchy (i.e. to analysis, synthesis, evaluation) student level cognition will move similarl Certainly, the strength of relationship between teacher and student low level cognition (approaching a one to one correspondence) would logically appear to remain consistent as one progresses up the cognitive hierarchy. However, other interrelationships found in the study suggest that the relationship of teacher to student cognitive behavior in terms of hierarchical level is more complex. As teachers ascended to higher cognitive levels, students ascended only slightly (one cognitive level) and then stopped (Factor 8, Appendix). Here the relationship appeared to end abruptly, with teacher cognitive categories at levels 4.00 (Application), 5.00 (Analysis), 6.00 (Synthesis), and 7.00 (Evaluation), showing no relationship to any level of student cognition. These same levels of student cognition (4.00 through 7.00) were not related to the cognitive or any other dimension of teacher behavior, but only to other dimensions of student behavior (i.e., RCS Categories 12, 13, and 14). (see Factor 3, Appendix)

These related findings emanating from these three factors (Factors 3, 8 and 12, Appendix) each involving classroom cognitive behavior point up several diverse implications relative to pre and in service teacher education.

In order to facilitate higher level student cognition, teachers should not remain fixed at the two lowest cognitive levels (1.00 knowledge, 2.00 translation). Neither should they simply move up the cognitive hierarchy. Rather, higher levels of student cognition appear to be facilitated when the teacher recedes to "field" and students become "figure", if one considers this in a perceptual psychology frame of reference. Apparently, in this system of relationships, the teacher uses very little verbal behavior, and acts only to acknowledge student contributions. Furthermore, the teacher neither accepts nor rejects student contributions (no positive or negative reinforcement).

In some measure, this implication calls for more training which casts the teacher in the role of a catalyst, helping him to channel and direct classroom discussion activities without either passing judgement on the quality or appropriateness of student contributions or becoming directly involved by inserting his own ideas. Such teacher behavior is highly "experimental" in the Deweyan sense and apparently a difficult teaching strategy to control.

Along this same line, certain student verbal behavior categories are significantly related to higher levels of student cognition. They are, in order of their magnitude of relationship:

RCS Category 13, Extending, clarifying contributions of another.

RCS Category 12, Student acceptance (positive reinforcement).

RCS Category 14, Student questions.

An examination of Factor 3, shows that the above student verbal categories load at .92, .81 and .52 respectively.

An informal, "tension-free" classroom climate, warmed by the teacher (RCS Category 1) is significantly related to experimental classroom practices. (Factor 7, Appendix)

Warming the climate should not be confused with "positive reinforcement." In fact, neither positive nor negative reinforcement were found to relate significantly with experimental behavior. Apparently, when the teacher accepts a student contribution such as "Yes!, that's right;" or corrects "No!, that's wrong," the transactional flow, in terms of the idea or contribution itself, is cut. The student may "feel good" about his contribution in the former case, or be embarrased in the latter, but the processes of reflective thinking or intelligent inquiry are prolonged more effectively when the teacher "withholds judgement on the student's behavior or contributions."

The key to the above relationship appears to be the congruency of informality in the warm threat-free climate with the teacher "participating in pupil activities," encouraging "free self expression," "active pupil participation," and making "pupils the center of attention."

This finding could imply that the conventional use of interaction analysis in teacher education programs, where all of the warmer, more positive categories (1, 2, and 3) are lumped together and labeled "indirect" teacher influence, may represent a needlessly gross concept. Each of the three "indirect" teacher verbal categories (i.e., L. Warming the climate, 2. Positive reinforcement or acceptance, 3. Amplifying, extending another's ideas--RCS Appendix) was found to function within a different set of relationships. Therefore, it seems important for teachers to understand that socio-emotional verbal categories which appear to differ in "degree" when compared only to other verbal categories may be found to differ in "kind" when coupled with other measurable dimensions of behavior (experimental).

Within the broader context of teacher-student verbal behavior reflecting socio-emotional climate, several implications appear to be relevant. One, which needs further investigation, suggests two diverse transactional styles each consistent within its own context.

Teachers who are characteristically warm and acceptant may on occasions use critical or climate cooling behavior, but almost always in small increments, thus exhibiting a high ratio of acceptant to rejectant behavior. The same teachers tend to use supportive emotional behavior very frequently but, again, in short units. Teachers considered to be cool and rejectant, on the other hand, rarely ever use warm or acceptant behavior. And, their use of rejectant or climate-cooling behavior may occur rather infrequently, but, when used, continues for rather long periods of time. This seems to imply a basic difference in behavior style suggesting that characteristically "cool," rejectant teachers over-react to what they preceive as inappropriate student behavior, prolong the "criticism" and thus focus on the emotional climate aspect of classroom behavior to the exclusion of the other measured dimensions. On the other hand, characteristically "warm," acceptant teachers show a greater frequency of emotional behavior, but use it intermittently.

This implies that teachers should not be encouraged to focus exclusively upon the socio-emotional dimension, but rather, to weave it in and out of the total behavioral stream at appropriately determined intervals. Thus, the sequencing or "purposeful patterning" of verbal behavior becomes equally as important as the nature of the behavior.

Student initiation and student climate-warming are mutually facilitative. (Factor 10) As the frequency of these student behaviors decreases, on this bi-polar factor, an increase in frequency is seen in teacher flexibility,[6] drill, narrow student response,[7] and student corrective feedback.

Again student, rather than teacher, behavior seems more powerful in generating broader, and perhaps more creative, student responses. This points up once more

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[6] Flexibility - defined as total number of cells that have tally of 1 or more.

[7] Narrow Student Response - the frequency of student category 15 (RCS) following any teacher verbal behavior.

the importance of peer group relationships, and the necessity for observing a broader spectrum of student verbal behavior, as accomplished by Ober's RCS.

The "experimentalism" dimension, used to measure "scope" of classroom behavior, appears to be significant in several sets of process relationships. In addition to the emotional climate-experimentalism relationship discussed earlier, teacher questions were found to be the most prominent transactional measure related to experimentalism (Factor 2). The balance of this factor shows part-whole relationships with the TPOR suggesting internal consistency.

Teacher vs Student control practices involve relationships crossing all three observed contexts for both teacher and student behavior.

When teachers exerted non-experimental control practices, they behaved at the lowest cognitive level as did their students. Furthermore, they behaved verbally through "teacher directions." (RCS Category 7) Such TPOR practices as "imposes external disciplinary control on pupil," "motivates pupil with privi-ledges, prizes and grades," and "approaches subject matter in direct business-like way" were coupled with teacher directions at a low cognitive level. (Factor 5).

Student control practices differed in that students functioned at a slightly higher cognitive level and "cooled" the emotional climate (Category 19, RCS, Factor 5)

Non-experimental differentiation on the TPOR (T has all p working at same task at same time, T holds all p responsible for certain material to be learned T evaluates work of all p by a set standard) the highest level of teacher cognition (Evaluation), and corrective feedback on the RCS load significantly in the same direction (Factor 11). When these teachers used evaluation level cognition, they did so verbally through corrective feedback, and behaved non-experimentally during the process.

This finding supports a previous implication that teacher high level cognitive behavior, as such, does not facilitate similar student cognition. But, more broadly, and of more importance to this study, is the implication that single dimension views of student and teacher relationships alone, whether cognitive, experimental, socio-emotional, or some other, do not produce a comprehensive enough view of classroom behavior. In fact it might even be misleading to make judgements about the production of student cognitive level by observing verbal behavior alone, or to hypothesize about emotional climate by observing only experimental-non experimental behavior.

At any rate, a more widely diversified, and exceedingly more complex, system of interrelationships may be identified and analyzed when viewed through the larger, more reflective, and more descriptive contexts of classroom behavior provided by a plurality of instrumentation.

Thus, most of the implications discussed here point toward less "direct" teacher behavior, less teacher dominance in the classroom, and more student involvement in transactional processes if the quality of student behavior advocated by most educational leaders as being desirable is to be facilitated (i.e., high level student cognition, creativity; warm, threat-free, socio-emotional climate; classrooms experimental in scope embracing much of Dewey's theory; etc.). Other questions remain, however, with regard to teacher education, if findings from these and other studies are to be utilized.

Should teachers be rigidly trained to produce those teaching behaviors that are found to be related to particular student behavior and, as predictibility increases, to shape student behavior within a given context? Or, should teachers simply be made aware of teaching behaviors found to be related to certain student behaviors and left to their own judgements concerning the production and control of these behaviors?

Whatever the answer to these questions, if indeed they are answerable, it appears that systematic observation will play a crucial role in training teachers to use or making them aware of the nature of their behavior as it relates to facilitating diverse styles, levels, and kinds of student behavior.

Furthermore, it appears that more than one or two dimensions of classroom behavior must be used in teacher training programs since certain crucial dimensions, heretofore elusive to direct measure, are being more sharply defined (i.e., cognitive dimension), and new dimensions in the exceedingly complex domain are falling into focus (i.e., image provoking behavior). Indeed, a number of additional dimensions presently remain undefined.

However, even now, the concept of "multi-dimensionality" or a plurality of observational systems provides a more fruitful approach toward viewing classroom behavior than a one-dimension look. The greater number of vantage points from which classroom behavior can be viewed, the greater the amount of control teachers can bring to bear upon their own behavior and that of their students in the classroom.

SUMMARY

In conclusion, it now appears to be possible to train teachers to:

1. Form multi-dimensional planning models including as many aspects of classroom behavior as feasible.
2. Utilize interrelated behavioral techniques and patterns which strengthen and support cross dimensional classroom processes.
3. Employ a plurality of systematic observational instrumentation as reflective and descriptive sources of feedback.
4. "Evaluate" their behavior based upon analysis of observational data, and thus modify planning models (Step 1) where appropriate.

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FIG. 1--Summary of Categories for the Reciprocal Category System

Category Number Assigned to Party 1[1]	Description of Verbal Behavior	Category Number Assigned to Party 2
1	"WARMS" (INFORMALIZES) THE CLIMATE: Tends to open up and/or eliminate the tension of the situation; praises or encourages the action, behavior, comments, ideas, and/or contributions of another; jokes that release tension not at the expense of others; accepts and clarifies the feeling tone of another in a friendly manner (feelings may be positive or negative; predicting or recalling the feelings of another are included).	11
2	ACCEPTS: Accepts the action, behavior, comments, ideas, and/or contributions of another; positive reinforcement of these.	12
3	AMPLIFIES THE CONTRIBUTIONS OF ANOTHER: Asks for clarification of, builds on, and/or develops the action, behavior, comments, ideas and/or contributions of another.	13
4	ELICITS: Asks a question or requests information about the content subject, or procedure being considered with the intent that another should answer (respond).	14
5	RESPONDS: Gives direct answer or response to questions or requests for information that are initiated by another; includes answers to one's own questions.	15
6	INITIATES: Presents facts, information, and/or opinion concerning the content, subject, or procedures being considered that are self-initiated; expresses one's own ideas lectures (includes rhetorical questions not intended to be answered).	16
7	DIRECTS: Gives directions, instructions, orders, and/or assignments to which another is expected to comply.	17
8	CORRECTS: Tells another that his answer or behavior is inappropriate or incorrect.	18
9	"COOL" (FORMALIZES) THE CLIMATE: Makes statements intended to modify the behavior of another from an inappropriate to an appropriate pattern; may tend to create a certain amount of tension (i.e., bawling out someone, exercising authority in order to gain or maintain control of the situation, rejecting or criticizing the opinion or judgment of another).	19
10	SILENCE OR CONFUSION: Pauses, short periods of silence, and periods of confusion in which communication cannot be understood by the observer.	10

[1] Category numbers assigned to Teacher Talk when used in classroom situation.
[2] Category numbers assigned to Student Talk when used in classroom situation.

Name of Teacher _____ Date _____ (month) (day) (year)

School _____ _____ (city) (state)

Grade _____ Subject _____ Name of Observer-judge _____

TEACHER PRACTICES OBSERVATION RECORD

DIRECTIONS

The Teacher Practices Observation Record provides a framework for observing and recording the classroom practices of the teacher. Your role an an observer is to watch and listen for signs of the sixty-two teacher practices listed and to record whether or not they were observed, WITHOUT MAKING JUDGMENTS AS TO THE RELATIVE IMPORTANCE OR RELEVANCE OF THOSE PRACTICES.

There are three (3) separate 10-minute observation and marking periods in each 30-minute visit to the teacher's classroom. These are indicated by the column headings I, 11, 111. During period 1, spend the first 5 minutes observing the behavior of the teacher. In the last 5 minutes go down the list and place a check ( ) mark in Column 1 beside all practices you saw occur. Leave blank the space beside practices which did not occur or which did not seem to apply to this particula observation period. A practice which occurs a dozen times gets one check mark, the same as an item which occurs only once.

Repeat this process for the second 10-minute period, marking in Column 111. Please add the total number of check marks recorded in columns 1, 11, and 111 for each teacher practice and record in the column headed TOT. There may be from 0 to 3 total check marks for each item.

TEACHER PRACTICES OBSERVATION RECORD

TOT	I	II	III	TEACHER PRACTICES
				A. NATURE OF THE SITUATION
				1. T makes self center of attention.
				2. T makes p center of attention.
				3. T makes something itself center of p's attention.
				4. T makes doing something center of p's attention.
				5. T has p spend time waiting, watching, listening.
				6. T has p participate actively.
				7. T remains aloof or detached from p's activities.
				8. T joins or participates in p's activities.
				9. T discourages or prevents p from expressing self freely.
				10. T encourages p to express self freely.
				B. NATURE OF THE PROBLEM
				11. T organizes learning around Q posed by T.
				12. T organizes learning around p's own problem or Q.
				13. T prevents situation which caused p doubt or perplexity.
				14. T involves p in uncertain or incomplete situation.
				15. T steers p away from "hard" Q or problem.
				16. T leads p to Q or problem which "stumps" him.
				17. T emphasizes gentle or pretty aspects of topic.
				18. T emphasizes distressing or ugly aspects of topic.
				19. T asks Q that p can answer only if he studied the lesson.
				20. T asks Q that is not readily answerable by study of lesson.
				C. DEVELOPMENT OF IDEAS
				21. T accepts only one answer as being correct.
				22. T asks p to suggest additional or alternative answers.
				23. T expects p to come up with answer T has in mind.
				24. T asks p to judge comparative value of answers or suggestions.
				25. T expects p to "know" rather than to guess answer to Q.
				26. T encourages p to guess or hypothesize about the unknown or untested.
				27. T accepts only answers or suggestions closely related to topic.
				28. T entertains even "wild" or far-fetched suggestion of p.
				29. T lets p "get by" with opinionated or stereotyped answer.
				30. T asks p to support answer or opinion with evidence.

TOT	I	II	III	
				D. USE OF SUBJECT MATTER
				31. T collects and analyzes subject matter for p.
				32. T has p make his own collection and analysis of subject matter.
				33. T provides p with detailed facts and information.
				34. T has p find detailed facts and information on his own.
				35. T relies heavily on textbook as source of information.
				36. T makes a wide range of informative material available.
				37. T accepts and uses inaccurate information.
				38. T helps p discover and correct factual errors and inaccuracies.
				39. T permits formation of misconceptions and over-generalizations.
				40. T questions misconceptions, faulty logic, unwarranted conclusions.
				E. EVALUATION
				41. T passes judgment on p's behavior or work.
				42. T withholds judgment on p's behavior or work.
				43. T stops p from going ahead with plan which T knows will fail.
				44. T encourages p to put his ideas to a test.
				45. T immediately reinforces p's answer as "right" or "wrong".
				46. T has p decide when Q has been answered satisfactorily.
				47. T asks another p to give answer if one p fails to answer quickly.
				48. T asks p to evaluate his own work.
				49. T provides answer to p who seems confused or puzzled.
				50. T gives p time to sit and think, mull things over.
				F. DIFFERENTIATION
				51. T has all p working at same task at same time.
				52. T has different p working at different tasks.
				53. T holds all p responsible for certain material to be learned.
				54. T has p work independently on what concerns p.
				55. T evaluates work of all p by a set standard.
				56. T evaluates work of different p by different standards.
				G. MOTIVATION, CONTROL
				57. T motivates p with privileges, prizes, grades.
				58. T motivates p with intrinsic value of ideas or activity.
				59. T approaches subject matter in direct, business-like way.
				60. T approaches subject matter in indirect, informal way.
				61. T imposes external disciplinary control on p.
				62. T encourages self-discipline on part of p.

FLORIDA TAXONOMY OF COGNITIVE BEHAVIOR

Directions

The Florida Taxonomy of Cognitive Behavior provides a framework for observing and recording the cognitive behavior of the teacher and students in a classroom. Your role as an observer is to watch and listen for signs of the behavior described and to record the behavior as it occurs.

There are five (5) separate 6-minute observation and marking periods in each 30-minute visit to the classroom. These are indicated by the column headings I, II, III, IV, and V. During period I, as you observe the behavior of the teacher and students, go down the list of items and place a check (✓) in the T column (teacher behavior) and/or P column (pupil behavior) beside all items you saw occur. Leave blank all the items that did not occur or for which you cannot make a discrimination. A particular item is marked only once in a given column, no matter how many times that behavior occurs within the 6-minute observation period.

Repeat this process for the second 6-minute period, marking in Column II. Repeat again for the third, fourth, and fifth 6-minute periods, marking in Columns III, IV, and V. Please add the total number of (✓) recorded in Columns I through V for each teacher or pupil behavior and record in the columns headed TOT. There may be from 0 to 5✓'s for each item.

_____
Name of Teacher

_____
Date

_____
School

_____
Name of Observer

_____
Grade & Subject

FLORIDA TAXONOMY OF COGNITIVE BEHAVIOR

TOT T	TOT P	T/ P	T/ P	T/ P	T/ P	T/ P	1.10 Knowledge of Specifics
							1. Reads
							2. Spells
							3. Identifies something by name
							4. Defines meaning of term
							5. Gives a specific fact
							6. Tells about an event

1.20 Knowledge of Ways and Means of Dealing With Specifics

							7. Recognizes symbol
							8. Cites rule
							9. Gives chronological sequence
							10. Gives steps of process, describes method
							11. Cites trend
							12. Names classification system or standard
							13. Names what fits given system or standard

1.30 Knowledge of Universals and Abstractions

							14. States generalized concept or idea
							15. States a principle, law, theory
							16. Tells about orgaztn or structure
							17. Recalls name of prin, law, theory

2.00 Translation

							18. Restates in own words or briefer terms
							19. Gives cncrt exmpl of an abstract idea
							20. Verbalizes from a graphic rprsntatn
							21. Trans vrbiztn into graphic form
							22. Trans fig stmnts to lit stmnts, or vice v
							23. Trans for lang to Eng, or vice versa

FLORIDA TAXONOMY OF COGNITIVE BEHAVIOR

TOT T	P	T/ P	T/ P	T/ P	T/ P	T/ P	3.00 Interpretation
							24. Gives reason (tells why)
							25. Shows similarities, diffrncs
							26. Summarizes or concludes frm obs of evdnce
							27. Shows cause and effect ritnshp
							28. Gives analogy, simile, metaphor
							29. Performs a directed task or process

4.00 Application

						30. Applies previous learning to new sitn
						31. Applies principle to new situation
						32. Apply abstrct knldg in a prctcl sitn
						33. Idntifs, selects, and carries out process

5.00 Analysis

						34. Distngshs fact from opinion
						35. Distngshs fact from hypothesis
						36. Distngshs cnclsn frm stmnts wch suppt it
						37. Points out unstated assumption
						38. Shows interaction or relation of elements
						39. Points out prticlrs to jstfy cnclsn
						40. Checks hypthss with given info
						41. Dstngshs rel frm irrelvnt stmnts
						42. Detects error in thinking
						43. Infers prpse, pt of view, thghts, feeling
						44. Recog bias or propaganda

6.00 Synthesis (Creativity)

						45. Reorganizes ideas, materials, process
						46. Produces unique cmmnctn, divergent idea
						47. Produces a plan, prpsd set of oprtns
						48. Designs an apparatus
						49. Designs a structure
						50. Devises scheme for classifying info
						51. Formulates hypothesis, intelligent guess
						52. Mks dedctns frm abstrct smbls, propostns
						53. Draws inductive generalizatn frm specifcs

7.00 Evaluation

						54. Evaluates something from evdnce
						55. Evaluated something from criteria

TABLE I VARIABLES

NUMBER	
1 - 19	Percentage column totals for each of the 19 categories. (RCS)
20	Total teacher talk. (Sum of column 1 through 9 expressed as a percent).
21	The acceptance-rejection ratio. (Total columns 1, 2 and 3, divided by total columns 8 and 9 + columns 1, 2 and 3).
22	Total lecture (Sum of column 6 expressed as a percent).
23	Prolonged student talk (Sum of column 11-19 for rows 11-19).
24	Extended amplification of student idea. (Percent of tallies in the 3-3 cell).
25	Steady state criticism ---------- cooling the climate. (Sum tallies in 9-9 cell expressed as a percent).
26	A measurement of teacher flexibility.
27	The warm-cool ratio (classroom climate) column 1 divided by column 9 + column 1.
28	The accept-correct ratio. (Total column 2 divided by total column 2 + total column 8).
29	The elicit-initiate ratio. (Total column 4 divided by total columns 4 + 6).
30	The amplify-direct ratio. (Total column 3 divided by total column 3 + total column 7).
31	Extended questioning (Percent of tallies in 4-4 cell).
32	Steady state lecture (Percent tallies in the 6-6 cell).
33	Steady state teacher talk. (Sum of tallies in diagonal of upper left matrix expressed as a percent).

TABLE I CONTINUED

34	Steady state student talk (Sum of tallies in diagonal 11-19, of lower right sub-matrix expressed as a percent).
35	Sum of student talk (Sum of columns 11-19).
36	Drill (Sum of 4=15 and 15-4 cells).
37	Inquiry (Sum of 3-3, 4-4, 15-15, and 16-16 cells).
38	TPOR Total Experimentalism Score
39	FTCB Median (Teacher)
40	FTCB Median (Pupils)
41	TPOR Median
42	A. Nature of Situation (items 1-10). TPOR
43	B. Nature of the Problem (items 11-20). TPOR
44	C. Development of Ideas (items 21-30). TPOR
45	D. Use of Subject Matter (items 31-40). TPOR
46	E. Evaluation (items 41-50). TPOR
47	F. Differentiation (items 51-56). TPOR
48	G. Motivation - Control (items 57-62). TPOR
49	Total items (teacher behavior). FTCB
	(Item measures by category). FTCB
50	A. Knowledge (items 1-21) Teacher
51	B. Translation (items 22-28) Teacher
52	C. Interpretation (items 29-34) Teacher
53	D. Application (items 35-38) Teacher
54	E. Analysis (items 39-50) Teacher
55	F. Synthesis (items 51-58) Teacher
56	G. Evaluation (items 59-69) Teacher

TABLE I CONTINUED

57 A measure of Lower/Higher cognitive levels. Teacher

$$\frac{1.10 + 1.20 = 1.30}{5.00 + 6.00 + 7.00} \text{ ratio}$$

58 A measure of memory categories with all other levels. Teacher

$$\frac{1.10 + 1.20 + 1.30}{2 + 3 + 4 + 5 + 6 + 7} \text{ ratio}$$

59 Total items (pupil behavior). FTCB

60 A. Knowledge (items 1-21) Pupils

61 B. Translation (items 22-28) Pupils

62 C. Interpretation (items 29-34) Pupils

63 D. Application (items 39-50) Pupils

64 E. Analysis (items 39-50) Pupils

65 F. Synthesis (items 51-58) Pupils

66 G. Evaluation (items 59-69) Pupils

67 A measure of Lower/Higher cognitive levels. Pupils

$$\frac{1.10 + 1.20 = 1.30}{5.00 + 6.00 + 7.00} \text{ ratio}$$

68 A measure of memory categories with all other levels. Pupils

$$\frac{1.10 + 1.20 + 1.30}{2 + 3 + 4 + 5 + 6 + 7} \text{ ratio}$$

69 TPOR Total Non-experimental Behavior Observed.

70 TPOR Total Experimental Behavior Observed.

Table 2

Rotated Factors Loadings for Three Observational Systems

	Measure	Factor												
		1	2	3	4	5	6	7	8	9	10	11	12	h^2
34	Steady State S Talk				.96									.99
23	Prolonged S Talk				.92									.98
37	Inquiry				.95									.97
35	Sum S Talk as %				.91									.96
41	TPOR Median Score		.96											.95
49	FTCB Total Score (T)	-.32							.84					.95
6	RCS T Initiation	-.86												.93
32	Steady State Lecture	-.87												.91
69	TPOR non Exp Behav		.58					.73						.91
22	T lecture as %	-.89												.90
70	TPOR Exp Behav		.49					.77						.90
59	FTCB Total Score (S)			-.38		.54							.35	.89
50	FTCB 1.00 Knowl (T)	-.33							.71				.45	.89
33	Steady State T Talk	-.80												.89
13	RCS Student Amplify			-.92										.89
38	TPOR Total Score							.90						.89
66	FTCB Evaluation (S)			-.92										.88
60	FTCB 1.00 Knowl (S)								.31				.64	.86
20	Sum T Talk as %	-.34			-.71									.86
65	FTCB 6.00 Synthesis (S)			-.86										.84
15	RCS Ans Questions				.75						.39			.83
4	RCS T Questions	.47	.49											.82
9	RCS T Cool Climate						-.83							.81
3	RCS T Amplify								.86					.79
21	Accept/Reject Ratio						.57					.52		.78
64	FTCB Analysis (S)			-.78										.78
30	Amplify/Direct Ratio	-.33							-.68					.76
12	RCS S accept			-.81										.76
29	Elicit/Initiate Ratio	.79												.75
45	TPOR-D Use of Subj. Matter		.77											.72
10	RCS Silence/Confusion		-.45		-.43									.72
44	TPOR-C Dev. of Ideas		.75											.71
16	RCS S Initiate				.37				-.66		-.66			.69

		1	2	3	4	5	6	7	8	9	10	11	12	h^2
25	Steady State Criticism						-.78							.67
52	FTCB Interpretation (T)								.73					.67
67	FTCB Ratio 1 (T) 123/4567												.68	.67
36	Drill (4-15,15-4 RCS)	.49	.38								.31			.67
46	TPOR E Evaluation		.73											.66
28	Accept/Correct Ratio		.33				.33					.57		.66
11	RCS S Warm Climate				.38						-.65			.64
63	FTCB Application (P)			-.61					.35					.64
51	FTCB Translation (T)	-.36				.45			.41					.63
26	Teacher Flexibility		.45								.40			.62
54	FTCB Analysis (T)								.69					.62
43	TPOR B Nature of Problem		.73											.62
39	FTCB Median Score (T)								.51				-.39	.60
2	RCS Teacher Accept		.43				.32							.59
61	FTCB Translation (P)					.65								.58
24	Extended Amplification									.72				.56
62	FTCB Interpretation (P)					.56			.35					.55
8	RCS Teacher Correct											-.59		.53
40	FTCB Median (P)			-.41									-.36	.52
7	RCS Teacher Directions	.34				-.37				-.40				.49
48	TPOR G Motivation, Control		.41			-.33								.49
55	FTCB Synthesis (T)								.63					.49
42	TPOR A Nature of Situation		.57											.48
56	FTCB Evaluation (T)											-.59		.48
68	FTCB Ratio 2 (P)					-.36							.37	.46
1	RCS T Warm Climate							.46						.44
27	RCS Warm/Cool Ratio						.52							.44
57	FTCB Ratio 1 (T)												.51	.42
18	RCS Student Correct										.36			.41
58	FTCB Ratio 2 (T)					-.30*							.35	.39
53	FTCB Application (T)								.58					.39
14	RCS Student Questions			-.52										.37
47	TPOR F Differentiation											-.38		.34
31	Extended T Questions		.30											.32
17	RCS Student Directions		(No significant loadings on any of the factors)											.26
19	RCS Student Cool Climate					.34								.20
5	RCS S Answer Question		(No significant loadings on any of the factors)											.18

*Decimals and values less than $\pm$ .30 are omitted

Factor I

Measure	TCHR Lecture vs Drill and Directions	Loading
29	Elicit/Initiate Ratio (4/6)	.79
36	Drill	.49
4	Teacher Questions	.47
7	Teacher Directions	.34
49	Total Tax T	-.32
50	Memory Tax T	-.33
30	Amplify/Direct Ratio (3/7)	-.33
20	Total Teacher Talk	-.34
51	Translation Tax T	-.36
33	Steady State Teacher Talk	-.80
6	Lecture	-.86
32	Steady State Lecture	-.87
22	Total Lecture Expressed as % of Total Talk	-.89

Factor 2

Measure	Experimentalism	Loading
41	TPOR Median Score	.96
45	TPOR D Use of Subject Matter	.77
44	TPOR C Development of Ideas	.75
43	TPOR B Nature of the Problem	.73
46	TPOR E Evaluation	.73
69	Total Non-Exp Behavior Observed	.58
42	TPOR A Nature of the Situation	.57
70	Total Exp Behavior Observed	.49
4	Teacher Questions	.49
26	Flexibility	.45
2	Teacher Accept	.43
48	TPOR G Motivation Control	.41
36	Drill	.38
28	Accept/Correct Ratio	.33
31	Extended Questioning	.30
10	Silence or Confusion	-.45

Factor 3

Measure	Student Cognition and Verbal Style	Loading
59	Taxonomy Pupil Total	-.38
40	Taxonomy Pupil Median Score	-.41
14	Student Questions	-.52
63	Taxonomy Pupil Application	-.61
64	Taxonomy Pupil Analysis	-.78
12	Student Acceptances of Behavior and Ideas	-.81
65	Taxonomy Pupil Synthesis	-.86
13	Student Amplifying Ideas of Another	-.92
66	Taxonomy Pupil Evaluation	-.92

Factor 4

Measure	Student Talk vs Silence and Teacher Talk	Loading
34	Steady State Student Talk	.96
37	Inquiry (3-3,4-4,15-15, 16-16 cells)	.95
23	Prolonged Student Talk	.92
35	Sum Student Talk (Total)	.91
15	Student Answer to Questions	.75
11	Student Warm	.38
16	Student Initiation	.37
10	Silence and Confusion	-.43
20	Total Teacher Talk	-.71

Factor 5

Measure	Student Cognitive Style and Control vs Teacher Control and Direction	Loading
61	Taxonomy Pupil Translation	.65
62	Taxonomy Pupil Interpretation	.56
59	Taxonomy Pupil Totals	.54
51	Taxonomy Teacher Translation	.45
60	Taxonomy Pupil Knowledge	.43
19	Student Cool Climate	.34
58	Ratio 2 Taxonomy Teacher $\frac{\text{Level 1}}{2+3+4+5+6+7}$	-.30
48	TPOR G Motivation Control (non-experimental)	-.33
68	Ratio 2 Taxonomy Pupil $\frac{\text{Level 1}}{2+3+4+5+6+7}$	-.36
7	Teacher Directions	-.37

Factor 6

Measure	Socio-Emotional Climate $\left(\begin{matrix}\text{Teacher}\\ \text{Influence}\end{matrix}\right)$	Loading
21	Accept/Reject Ratio	.57
27	Warm/Cool Ratio	.33
2	Teacher Accept	.32
25	Steady State Criticism	-.78
9	Teacher Cool Climate	-.83

Factor 7

Measure	Teacher Experimentalism vs Non-Experimentalism	Loading
38	TPOR Total Score	.90
70	Experimental Behavior	.77
1	Warming Climate (TCHR)	.46
69	Non-Experimental Behavior	-.73

Factor 8

Measure	Teacher-Student Cognitive Behavior	Loading
49	Taxonomy Teacher Total	.84
52	Taxonomy Teacher Interpretation	.73
50	Taxonomy Teacher Knowledge	.71
54	Taxonomy Teacher Analysis	.69
55	Taxonomy Teacher Synthesis	.63
53	Taxonomy Teacher Application	.58
39	Taxonomy Teacher Median	.51
51	Taxonomy Teacher Translation	.41
59	Taxonomy Pupil Total	.41
69	Taxonomy Pupil Interpretation	.35
63	Taxonomy Pupil Application	.35
60	Taxonomy Pupil Knowledge	.31

Factor 9

Measure	Teacher Amplification vs Direction	Loading
3	Amplification of Ideas	.86
24	Extended Amplification	.72
30	Amplify/Direct Ratio	.68
7	Directions	-.40

Factor 10

Measure	Student Warmly-Initiative vs Corrective Responsive	Loading
26	Teacher Flexibility	.40
15	Student Answer to Questions	.39
18	Student Correct	.36
36	Drill	.31
11	Student Warm	-.65
16	Student Initiation	-.66

Factor 11

Measure	Teacher Evaluation of Student Behavior	Loading
28	Accept/Correct Ratio (2/8)	.57
21	Accept/Reject Ratio (1+2+3/8+9)	.52
47	TPOR F (Differentiation)	-.38
56	Taxonomy Teacher Evaluation	-.59
8	Corrective Feedback (TCHR)	-.59

Factor 12

Measure	Classroom Cognitive Level	Loading
67	Ratio 1 Taxonomy Pupil	.68
60	Taxonomy Pupil Knowledge	.64
57	Ratio 1 Taxonomy Teacher	.51
50	Taxonomy Teacher Knowledge	.45
68	Ratio 2 Taxonomy Pupil	.37
58	Ratio 2 Taxonomy Teacher	.35
59	Total Taxonomy Pupil	.35
40	Median Taxonomy Pupil	-.36
39	Median Taxonomy Teacher	-.39